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ABSTRACT

The Appalachian Regional Commission (ARC) saw the sixth Applied Technology Satellite (ATS-6) as a means of improving the quality of inservice teacher education by distributing high quality courses from a central source. There were 15 classroom sites scattered from New York to Alabama; the basic television reception equipment cost approximately $4,000 per site. Five of the 15 sites were also equipped to receive and transmit 2-way radio via ATS-3. There were 4 major learning activities: (1) 30-minute, pretaped televised programs which included lectures, interviews, and demonstration teaching; (2) audio reviews of the pretaped television programs; (3) live seminars which allowed students to ask questions of their teachers and other experts; and (4) resource libraries at each site. There is a one-page summary of each of the following: evaluation strategies; how well did the equipment work; how well did the system for relaying seminar questions work; what were the participants like; how well did the participants like the different learning activities; how much did the participants learn; did the participants become convinced of the values of course concepts and procedures; are the teachers using the skills learned; and conclusions. (KKC)

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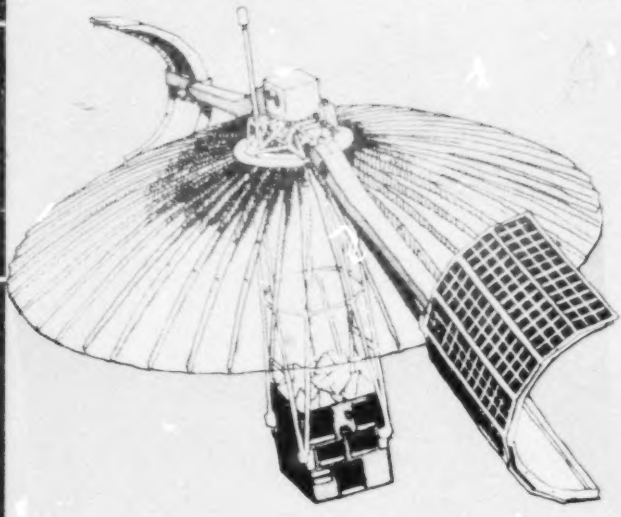

EDUCATION ON THE BEAM

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EDUCATION ON THE BEAM:

A PROGRESS REPORT ON THE APPALACHIAN EDUCATION SATELLITE PROJECT[1]

William J. Bramble, Claudine Ausness, and Rodger Marion

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Last May the National Aeronautics and Space Administration launched the sixth in its series of Applied Technology Satellites (ATS). Various experiments were planned to show different ways the satellite might be used. One of the ATS-6 telecommunications experiments, sponsored by the National Institute of Education, is the Appalachian Education Satellite Project (AESP).

The Appalachian Regional Commission (ARC), established to promote the overall development of the Appalachian region, saw ATS-6 as a means of improving the quality of inservice education by distributing high quality courses from a central source.

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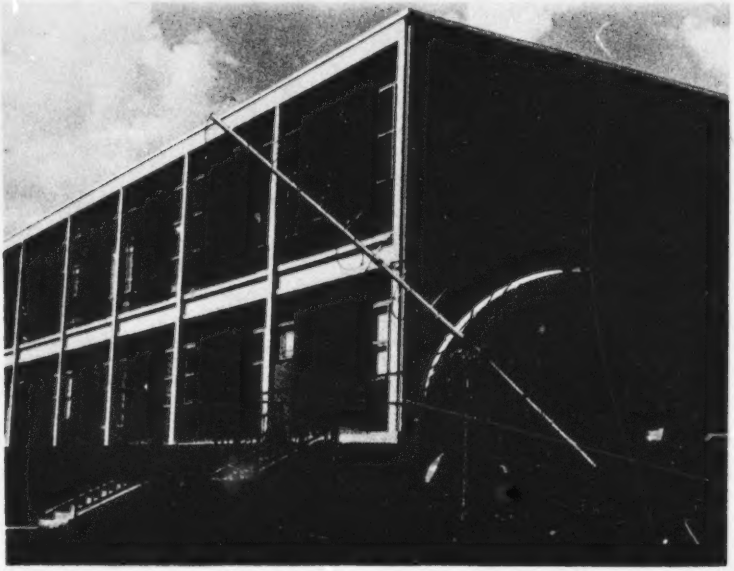
[1]Based on a paper presented by Dr. Bramble, the Director of Evaluation for the Appalachian Education Satellite Project, at the 1975 annual meeting of the American Educational Research Association, April 1, 1975, in Washington, D.C., as part of a symposium entitled "Major Communications Satellite Demonstration for Education, Health, and Technology.



Audio-Video and Two-Way Radio Reception
Equipment at Main Site in Cumberland, Maryland

ARC realized that costs for reception equipment are a major factor in Appalachia where needs may be great, but communities can least afford the expense. For this reason ATS-6 was especially appropriate, since the basic TV reception equipment it required was inexpensive, costing approximately $4,000 per site compared to hundreds of thousands of dollars for previous satellite reception systems.

For the AESP demonstration, there were 15 classroom sites scattered from New York to Alabama. These sites are designated by circles in Figure 1. All 15 sites were equipped to receive pretaped and live programs via ATS-6. The sites are located at Regional Education Service Agencies (RESAs). Five of the 15 sites, called main sites, were also equipped to receive and transmit two-way radio via ATS-3. The main sites are identified in Figure 1 by an asterisk. The black triangles in Figure 1 show the 2 ancillary sites associated with each main site.

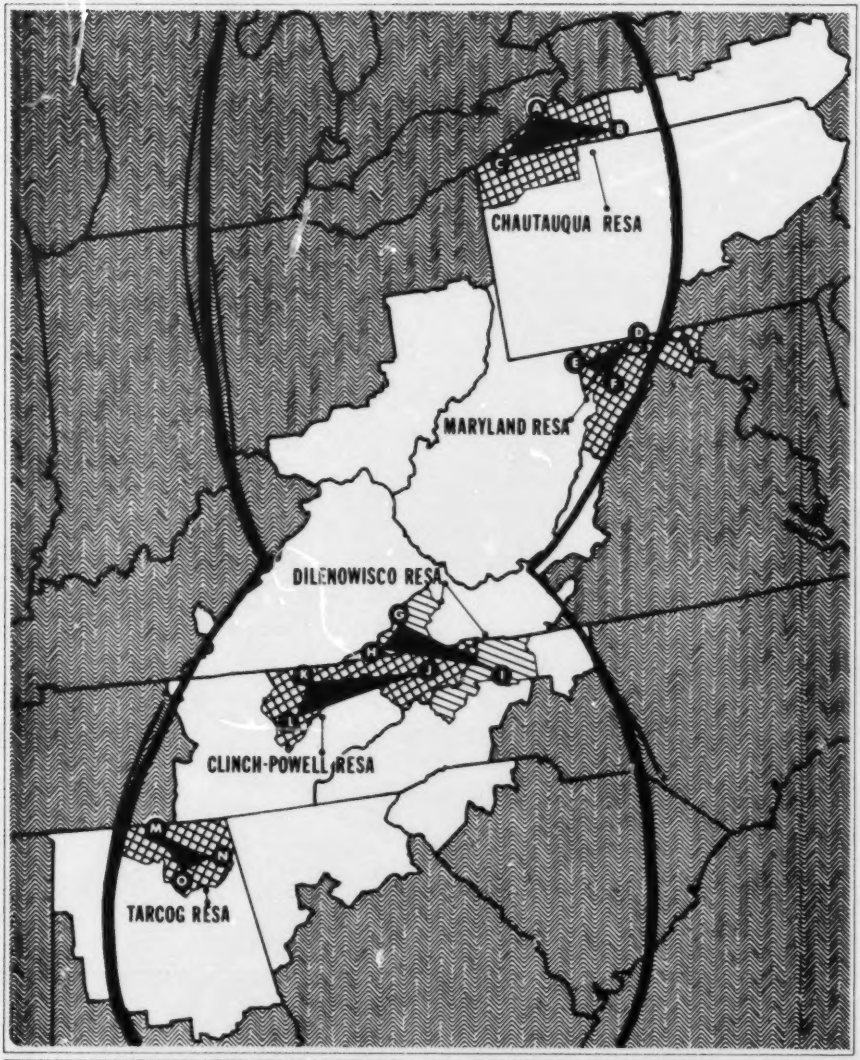
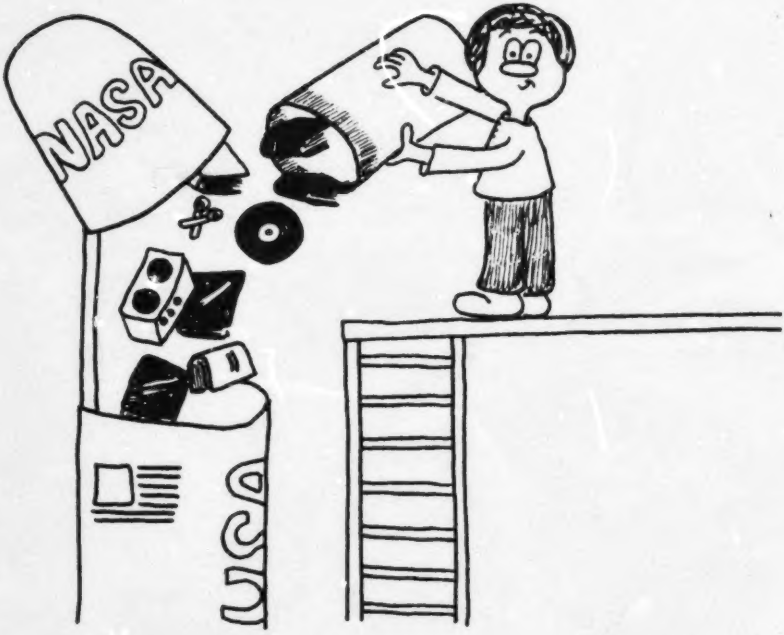


FIG. 1 MAP OF THE APPALACHIAN REGION SHOWING THE FIVE RESA CLUSTERS, RECEIVING TRIANGLES, AND APPROXIMATE SATELLITE FOOT PRINT.

*	A. Fredonia, N.Y.	I.	Boone, N.C.
	B. Olean, N.Y.	J.	Johnson City, Tenn.
	C. Edinboro, Pa.	*	K. LaFollette, Tenn.
*	D. Cumberland, Md.		L. Coalfield, Tenn.
	E. McHenry, Md.	*	M. Huntsville, Ala.
	F. Keyser, W. Va.		N. Rainsville, Ala.
*	G. Norton, Va.		O. Guntersville, Ala.
	H. Sticklyville, Va.		

The University of Kentucky was chosen as the Resource Coordinating Center (RCC) for the development of course materials. (See AESP Technical Report #2 [Ausness & Bowling] for more detailed background information.) The RCC designed the following learning activities to exploit different capabilities of ATS-6 used alone and sometimes in conjunction with ATS-3:



1) A major learning activity was the series of 30 minute, pretaped televised programs. They differed from most graduate-level lectures in that they were punctuated with filmed interviews of content experts and teachers and short episodes showing actual Appalachian teachers applying instructional techniques in their classrooms.

Teachers at Cumberland, Maryland site
Preparing to Watch a TV Program

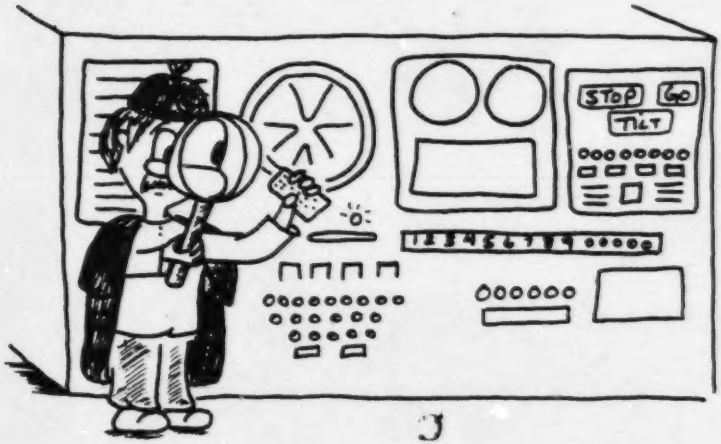
2) Another satellite-delivered learning activity was a series of audio reviews of the pretaped TV programs. These made use of the four-channel audio capacity of ATS-6. Each review consisted of a question describing a hypothetical teaching situation and four alternative approaches to the problem. The student selected the response he felt was most appropriate by depressing a button on his response pad. He then heard an explanation of the merits of his response.

Werner Von Braun, Vice President of Engineering and Development, Fairchild Industries, taking part in four-channel audio review

3) Live seminars, forum in format, made it possible for students to ask their teacher and other experts questions during a live broadcast. Seminar questions were relayed from the 10 ancillary sites by landline teletype to the five main sites for VHF transmission to the broadcast studio via ATS-3.

Career Education Seminar In-progress at the University of Kentucky Broadcast Studio

4) The students had resource libraries at each site which included materials selected to complement each course. They also had access through ATS-3 to run searches for instructional materials using computerized information retrieval systems.



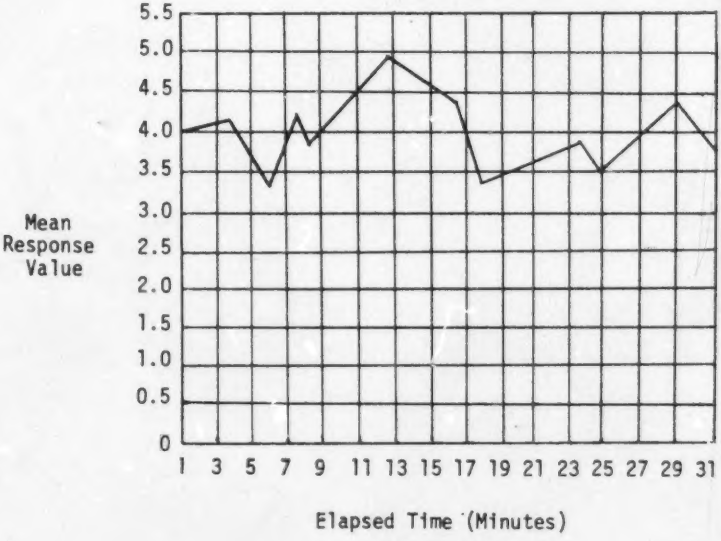
Some of the other classroom activities in the course did not depend on satellite delivery. For instance, in laboratory sessions the students had the opportunity to apply what they learned in the televised programs. Immediate feedback on the unit tests helped the students determine how well they understood the material covered in each unit.

Students at Fredonia, New York Doing Laboratory Exercises

EVALUATION STRATEGIES

During the development of these learning activities, the AESP Evaluation Component implemented a number of evaluation strategies to provide information useful in product development. Some of the formative evaluation activities carried out while products were being developed included: 1) providing descriptive information on the region, 2) identifying, for filming, classes where principles central to the courses were being applied, 3) implementing procedures for field review of scripts by teachers and content experts, 4) performing experiments to determine the most effective sequences and formats for the learning activities, and 5) carrying out audience reaction studies to identify spots in programs that needed reworking.

In the audience reaction study, for example, the participants indicated at different points in a semifinal version of a program whether they were interested in what was being presented. In Figure 2 are the ratings for the program. The horizontal axis identifies the points in the program (in minutes) when the reviewers were asked to rate, and the vertical axis identifies the average ratings assigned by the viewers. The closer to five the more interesting and the closer to 1 the



GRAPH OF AUDIENCE REACTION TO TELEVISED LECTURE

Filming Exemplary Programs Used by
Appalachian Teachers

less interesting the participants found that section. The ratings, on the average, were near the positive (5) end of the scale. Most of the high peaks of interest occurred during classroom scenes showing teachers applying the procedures with actual students. Interest was usually less during studio shots of the narrator. (See AESP Technical Report #3 [Bramble, Ausness, & Wetter] for more detailed information on formative evaluation study.)

Some of the summative evaluation activities carried out after products were finalized to determine their effectiveness included: 1) unit tests, 2) pre- and post achievement tests, 3) pre- and post attitude tests, 4) pre- and post teaching practices inventories, 5) user ratings of the quality of the learning activities, 6) equipment checklists, and 7) cost studies comparing alternative formats. (See AESP Technical Report #4 [Bramble, Ausness, Wetter, & Harding] for more detailed description of summative evaluation activities.) The data collected and analyzed by the AESP Evaluation Component provide preliminary answers for many questions asked about the effectiveness of the satellite-delivered courses.

HOW WELL DID THE EQUIPMENT USED TO DELIVER AND RECEIVE THE TELEVISION PROGRAMS WORK?

As indicated in Figure 3, the delivery system includes the satellite, the access station equipment, and the landline links between the broadcast studio and the uplink. This delivery system was inoperative during 4 of the first 48 programs transmitted; that is, it was operative 92 percent of the time. Actually there were only two transmission failures, due once to a malfunction in the telephone link between the television studio and the uplink and another time to a malfunction in a power transformer at the uplink. The delivery system should have a higher reliability in the future, since these figures are based on the first six months of use.

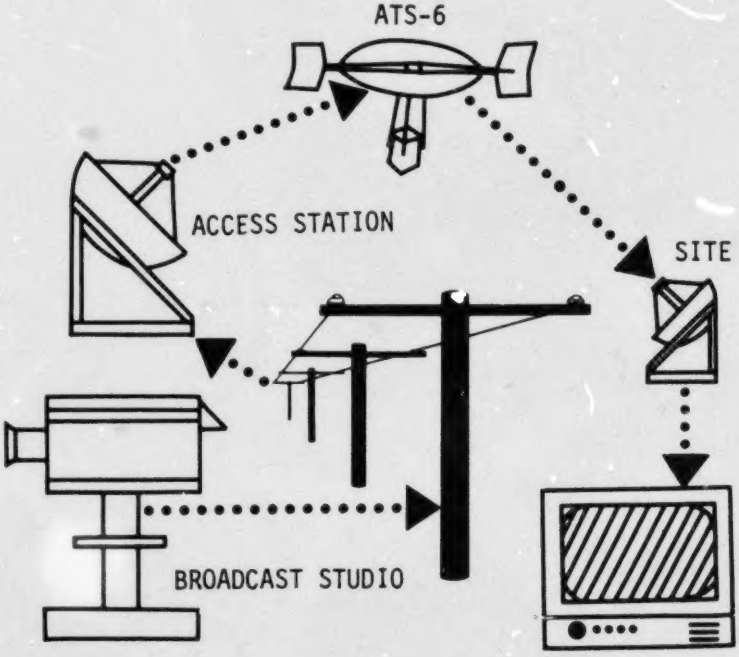


FIGURE 3 -- AUDIO-VIDEO DELIVERY SYSTEM

As indicated in Figure 4, site reception equipment for the AESP courses included all ground equipment at the site necessary for reception of audio-video and the four audio signals. The reception system at individual sites was operative 98 percent of the time. Procedures for making up missed programs were implemented for each failure; thus participants were ultimately exposed to the total course content.

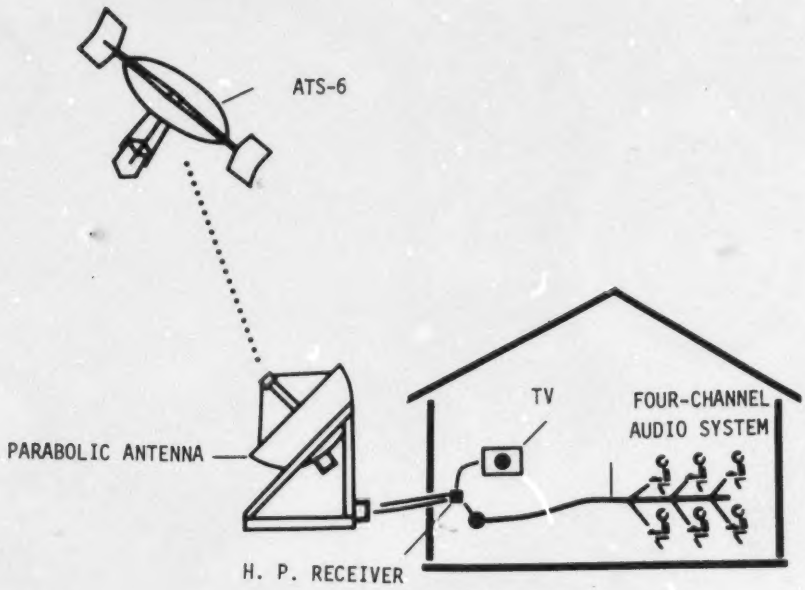


FIGURE 4 -- SITE AUDIO-VIDEO AND FOUR-CHANNEL GROUND EQUIPMENT

HOW WELL DID THE SYSTEM FOR RELAYING SEMINAR QUESTIONS WORK?

As depicted in Figure 5 equipment failures in the relaying of seminar questions could occur in the landline teletype connection between the ancillary and the main sites, in the VHF equipment at the main sites, including the helical antenna, in the satellite itself, or in the VHF equipment at the broadcast studio. The teletype and VHF site reception transmission equipment were operational 96 percent of the time. The VHF equipment at the broadcast studio was operational 91 percent of the time. The lower reliability at the broadcast studio was due primarily to initial problems with local radio interference. (See AESP Technical Report #5 [Bramble, Ausness, & Freeman] for a more detailed description of equipment functioning.)

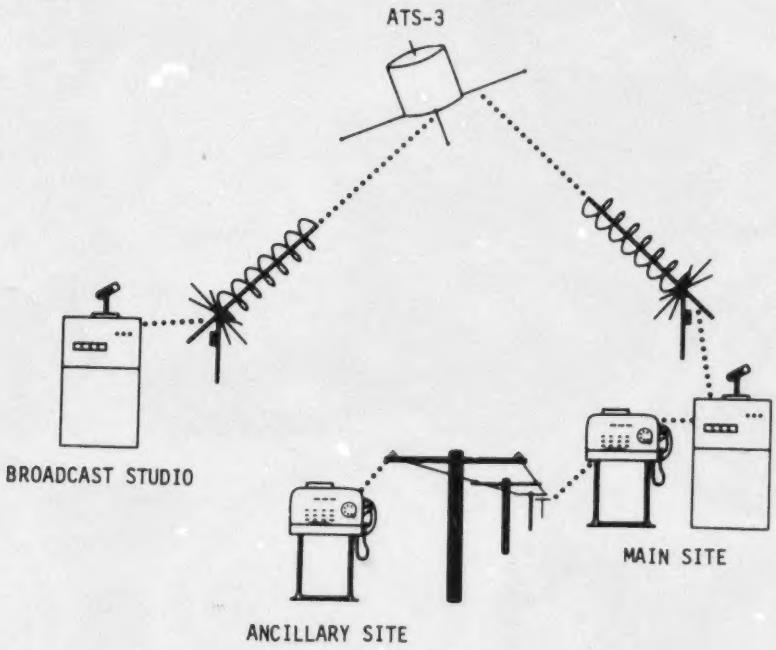


FIGURE 5 -- VHF- TELETYPE RELAY SYSTEM

WHAT WERE THE PARTICIPANTS WHO TOOK THE COURSE LIKE?

As indicated in Table 1, there were 291 participants in the Diagnostic and Prescriptive Reading Instruction course for K-3 teachers (DPRI); 246 in the Career Education course for elementary school teachers (CEE); and 248 in the Career Education course for secondary teachers (CES). As indicated below the typical participant was a woman in her mid-thirties who had taught 9-10 years, but had not completed her master's degree or taken many graduate courses in the course subject. As might be expected more of the participants in the courses for elementary teachers were women, and more of the participants in the courses for secondary teachers had advanced degrees.

TABLE 1

BACKGROUND CHARACTERISTICS OF COURSE PARTICIPANTS

Characteristics	DPRI	CEE	CES
Number	291	246	248
% Females	93%	75%	50%
Average Age (years)	35	36	35
% Teachers	90%	75%	70%
Teaching Experience (years)	9	9	10
% Masters Degree	18%	26%	44%
Average Graduate Courses in Area	1	0	.5

HOW WELL DID THE PARTICIPANTS LIKE THE DIFFERENT LEARNING ACTIVITIES?

Table 2 shows the amount of information the course participants felt they received from the instructional activities, compared to similar on-campus activities. A rating of 3, on a one to five scale, means the activity was perceived as equivalent to a similar on-campus activity in conveying information. Ratings for the televised programs greater than 3 mean the participants thought the televised programs were better in conveying information than typical on-campus lectures. The average ratings for the televised seminars, which center around 3.5, indicate that the participants perceived them as slightly superior to on-campus graduate seminars. The laboratory exercises, audio reviews, and retrieval information systems ratings were judged respectively to be somewhat superior to on-campus laboratory sessions, class quizzes, and supplementary materials. All the means are significantly above the neutral ratings of 3.0 at the .05 level. (See AESP Technical Report #6 [Marion, Bramble, & Wetter] and #7 [Harding, Bramble, & Marion] for more detailed information on user reactions to learning activities.)

TABLE 2

TEACHER RATINGS OF LEARNING ACTIVITIES

Learning Activities	DPRI		CEE		CES	
	Mean	SE	Mean	SE	Mean	SE
Pretaped TV Programs	4.0	.06	3.5	.07	---	---
Live, Interactive Seminars	3.6	.07	3.4	.08	3.5	.12
Laboratory Exercises	3.8	.06	3.6	.06	3.3	.12
Audio Reviews	3.5	.07	3.5	.07	---	---
Information Retrieval Systems	3.8	.07	3.6	.07	3.6	.14

HOW MUCH DID THE PARTICIPANTS LEARN?

In Table 3 is the average percent of items the participants answered correctly, on the pre- and posttests for each course. From the entrance level it can be seen the course participants were, on the average, familiar with the content of the course. However, there was still a 15 percent gain in knowledge of course concepts after exposure to the reading course activities, and a 12-13 percent gain in knowledge after completion of the career education course activities. The pre-post gains on the achievement tests for all three courses were significant at the .05 level when variation among sites was removed.

TABLE 3

CHANGES IN KNOWLEDGE OF COURSE CONCEPTS

Test Information	DPRI	CEE	CES
Entry Level	62%	68%	59%
Exit Level	77%	80%	72%
Gain	15%	12%	13%
Number of Items	60	51	55

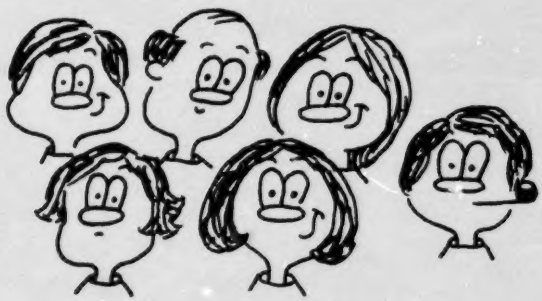
DID THE PARTICIPANTS BECOME CONVINCED OF THE VALUES OF COURSE CONCEPTS AND PROCEDURES?

In Table 4 are the average item means for the pre- and post-attitude questionnaires in each course. While the pre- to post gains on these attitude questionnaires were smaller than those on the achievement tests, they are positive in direction and significant at the .05 level when variation among sites was removed. The greater change in attitude in the secondary career education course may be due to its longer length, 16 weeks compared to 8 weeks for the elementary courses. However, it should be pointed out that the effectiveness of all the courses in changing measured attitudes about the course materials was relatively small.

TABLE 4

MEAN ITEM GAINS ON ATTITUDE QUESTIONNAIRES

Item Information	DPRI	CEE	CES
Pre-Average Response	2.97	3.92	3.91
Post-Average Response	3.06	3.98	4.19
Average Item Gain	.09	.06	.28
Number of Items	23	25	28



ARE THE TEACHERS IN THEIR CLASSROOMS USING THE SKILLS LEARNED IN THE COURSE?

In a follow-up study of the reading and elementary career education course, 50 course participants were randomly selected from each course to report the extent to which they had used information learned in the summer courses. All 19 CEE respondents and 33 of the 35 DPRI respondents who returned the questionnaire said they learned many useful skills they were actually applying in their classroom. The remaining 2 DPRI respondents said they felt the skills they learned were useful but not applicable in their situation. These illustrative comments made by teachers indicate the impact the course has had on their classroom teaching:

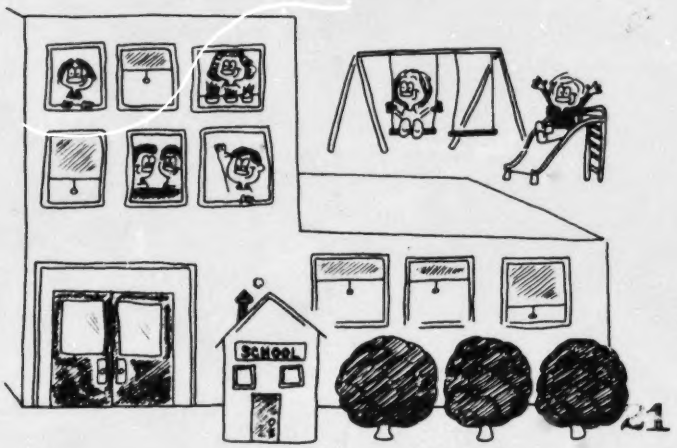
"Attitudes toward reading have improved."
"All have progressed at a more rapid pace than last year."
"Most effective techniques I have ever used."
"The children are very excited."
"Pupils have developed better attitudes and more ambition for the future."

Other comments made by the teachers indicate those who took the reading course are applying what they learned more than those who took the career education course. This may be due to the fact that reading techniques are more easily substituted for previous methods of instruction, while the career education techniques often involve more extensive curriculum redevelopment. The point to note is that, even though the measured changes in attitude were small, the teachers seem to be applying in their classrooms the instructional techniques learned in the AESP courses. (See AESP Technical Report #8 [Marion, Bramble, & Ausness] and #9 [Bramble, Marion, & Ausness] for detailed information regarding changes in participant knowledge, attitude and behavior.)

WHAT CONCLUSIONS CAN BE DRAWN FROM THE RESULTS JUST DISCUSSED?

- It is technically feasible using satellite delivery and inexpensive ground reception equipment to provide graduate education courses to students scattered over large geographical areas.
- Site representatives who are non-content experts can administer these courses, when provided with sufficient instructions and easy access to the Resource Coordinating Center by way of two-way radio.
- The course participants preferred the learning activities in the satellite-delivered courses to on-campus graduate education courses with which they were familiar.
- Participants in the courses typically gained in knowledge of the course content and are now applying what they learned in their classrooms.

In a less-than-two-year period the Appalachian Education Satellite Project will have produced and implemented four graduate courses for delivery via satellite to approximately 1200 teachers. The delivery of such graduate education courses by satellite may be one way to expand the educational opportunities available to Appalachians.



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